CLAIMS

What is claimed is:

1. A device for sensing NO_x compounds comprising:
a calix[4]arene compound capable of forming a complex with at least one NO^+ cation, wherein a detectable charge-transfer reaction occurs between the NO^+ cation and the calix[4]arene.

2. The device of claim 1, wherein the detection is selected from the group consisting of visualization, measurement of electrochemical changes, and measurement of spectroscopic changes.

3. The device of claim 1, wherein the complex undergoes dissociation.

4. The device of claim 3, wherein the complex is decolorized.

5. The device of claim 1, wherein the calix[4]arene compound is alternatively a cone calix[4]arene, a 1, 3-alternate calixarene or a combination thereof.

6. The device of claim 1, wherein the calix[4]arene compound is optionally immobilized, in solution, attached to a ligand, attached to a solid support, or any combination thereof.

7. The device of claim 1, wherein the NO_x compounds are optionally a gas, liquid, solution, mixtures of gases, or a combination thereof.

8. The device of claim 1, wherein the complex is a storage device for the NO^+ cation.

9. The device of claim 1, wherein the complex is capable of transferring the NO^+ cation to a substrate.

10. The device of claim 1, wherein the complex is stabilized by one or more Lewis acids.

11. A device for purifying chemical compounds containing NO_x comprising:

a calix[4]arene compound, wherein the calix[4]arene compound complexes a NO^+ cation from the chemical compound and is capable of transferring the NO^+ cation produced from the NO_x.

12. The device of claim 11, wherein the calix[4]arene compound is optionally immobilized, in solution, attached to a ligand, on a solid interface, attached to a solid support, or a combination thereof.

13. The device of claim 11, wherein the complex is a storage device for the NO^+ cation.

14. The device of claim 13, wherein the complex is chemically stable for at least several weeks.

15. A method of purifying chemical compounds comprising:

exposing a calix[4]arene compound to a mixture of chemical species;

allowing the calix[4]arene compound to interact with the mixture, wherein the calix[4]arene compound forms an NO^+ complex.

16. A molecular container comprising:

a calix[4]arene compound; and

at least one NO^+ cation.

17. The molecular container of claim 16, wherein the calix[4]arene compound complexes the NO^+ cation and is capable of storing it.

18. The molecular container of claim 16, wherein the calix[4]arene compound complexes the NO^+ cation and is capable of transferring it to another substrate

19. An optical switch comprising:

a calix[4]arene-nitrosonium complex in which the nitrosonium is capable of changing between a free and complexed state wherein the switching can be detected optically.

20. An optical switch comprising:

a means for complexing a nitrosonium cation; and

a means for detecting the presence of the complex.